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BOX PCT

Commissioner for Patents
Washington, D.C. 20231

PCT/JP00/03732
-filed June 8, 2000

Re: Application of Chikara YOKOYAMA and Yuji FUNABA
DATA BACK UP APPARATUS AND STEP-UP/DOWN POWER SUPPLY
Assignee: MITSUBISHI DENKI KABUSHIKI KAISHA
Our Ref: Q68037

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter I of the Patent Cooperation Treaty:

- ☑ an executed Declaration and Power of Attorney.
- ☑ an English translation of the International Application.
- ☑ three (3) sheets of drawings.
- ☑ an executed Assignment and PTO 1595 form.
- ☑ Information Disclosure Statement and PTO form 1449.

It is assumed that copies of the International Application, the International Search Report, the International Preliminary Examination Report, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

The Government filing fee is calculated as follows:

Total claims	8	-	20	=		x	$18.00	=	$.00
Independent claims	2	-	3	=		x	$84.00	=	$.00
Base Fee									$890.00
TOTAL FILING FEE									$890.00
Recordation of Assignment									$ 40.00
TOTAL FEE									$930.00

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Q68037

Checks for the statutory filing fee of $890.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Respectfully submitted,

Robert J. Seas, Jr.
Registration No. 21,092

RJS/slb

3/prts

SPECIFICATION

Data Back up Apparatus and Step-Up/Down Power Supply

Technical Field

This invention relates to a data backup apparatus for backing up data by controlling power fed to a memory, and a step-up/down power supply for feeding power to on-vehicle equipments, e.g., a car navigation device, and so on.

Background Art

In a conventional data backup apparatus, an SRAM, a rewritable ROM or the like is installed therein, and data in an on-vehicle equipment such as a car navigation device is saved in the SRAM or the like.

However, in the case of using an SRAM, the limited amount of storable information per area makes it difficult to save a large amount of data.

In addition, in the case of using a rewritable ROM, a considerable time is required for information rewriting, and due to its inherent characteristics, a limit is placed on the number of rewritable times. Thus, in general, data saving by use of a ROM has been limited to a program code and so on, which requires no rewriting operation, and work information has not been saved at all.

Therefore, it was required to save only minimum necessary information in the SRAM and read other data from an external memory or the like at the time of starting the on-vehicle equipment, thereby to restructure the data in a main memory.

Since the conventional data backup apparatus is constructed as mentioned above, it requires a large amount of data, such as map information on the surroundings, to be read from an external memory or the like, at the time of starting the on-vehicle equipment. Thus, there has been such an inevitable problem in the conventional art that a considerable time is required before the on-vehicle equipment starts its actual operation.

The installation of a large-capacity SRAM eliminates the necessity of reading a large amount of data from an external memory at the time of starting the on-vehicle equipment. However, because of the limited

amount of storable information per area and the high price of an SRAM, it is not practical to install a large-capacity SRAM in an on-vehicle equipment.

The present invention has been made to solve the foregoing problems, and it is an object of the invention to provide a data backup apparatus capable of saving a large amount of data inside an on-vehicle equipment.

It is another object of the invention to provide a step-up/down power supply capable of stably operating an on-vehicle equipment by applying a predetermined voltage to the on-vehicle equipment even when fluctuation occurs in a voltage applied from a main power supply such as an on-vehicle battery.

Disclosure of the Invention

In accordance with the present invention, there is provided a data backup apparatus, comprising: control means for changing a dynamic RAM to a self-refresh mode when detection means detects an OFF command of a main power supply, and feeding power from a backup power supply to the dynamic RAM.

Thus, it is possible to save a large amount of data inside an on-vehicle equipment.

According to the data backup apparatus of the invention, power is fed from the main power supply to the dynamic RAM during the period from the detection of the OFF command of the main power supply to the completion of the changing to the self-refresh mode.

Thus, it is possible to surely save the data of the on-vehicle equipment.

According to the data backup apparatus of the invention, among a plurality of memory areas constituting the dynamic RAM, a memory area that receives power from the backup power supply is designated, and power is fed only to the thus designated memory area.

Thus, it is possible to reduce power consumption during the backing-up operation.

According to the data backup apparatus of the invention, information regarding the memory area to receive power from the backup power supply is indicated.

Thus, it is possible to verify the normal ending of previous processing, and normal backing-up during the stopped period. It is also possible to verify an unexpected memory loss or the like caused by a reduction in a backup power supply or the like during the backing-up operation.

According to the data backup apparatus of the invention, the feeding of power from the main power supply to a predetermined equipment is stopped, when the output voltage of the main power supply is reduced.

Thus, it is possible to suppress a reduction in the output voltage of the main power supply.

According to the data backup apparatus of the invention, if an SDRAM is used as the dynamic RAM, the control means and the SDRAM are kept separated from each other until the initial setting of the control means is completed.

Thus, it is possible to prevent the destruction or the like of data saved in the SDRAM.

In accordance with the invention, there is provided a step-up/down power supply, comprising: a step-up DC/DC converter for outputting a predetermined voltage by stepping up a voltage applied from a main power supply when the applied voltage drops below a reference voltage.

Thus, since the predetermined voltage can be applied to an on-vehicle equipment even if a cranking operation or the like causes a reduction in the voltage applied from the main power supply, it is possible to stably operate the on-vehicle equipment.

According to the step-up/down power supply of the invention, a voltage signal is captured from an outputting stage for outputting a predetermined voltage, so as to activate a switching element of the step-up DC/DC converter.

Thus, even if the voltage applied from the main power supply drops below the operating voltage of the switching device, it is possible to continue the operation of the step-up DC/DC converter.

Brief Description of the Drawings

Fig. 1 is a schematic diagram showing a data backup apparatus according to a first embodiment of the present invention.

Fig. 2 is a schematic diagram showing a step-up/down power supply according to a second embodiment of the invention.

Fig. 3 is an explanatory view illustrating a power supply detection sequence.

Best Modes for Carrying-out the Invention

Next, the preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

(First Embodiment)

Fig. 1 is a schematic diagram showing a data backup apparatus according to a first embodiment of the invention. In the drawing, a reference numeral 1 denotes a dynamic RAM (DRAM) for storing the data of an on-vehicle equipment such as a car navigation device, and the DRAM includes a plurality of memory areas A to C.

A reference numeral 2 denotes a battery (main power supply) installed in a vehicle; 3 a step-up/down power supply that receives a voltage applied from the battery 2 and outputs a predetermined voltage even if fluctuation occurs in the applied voltage; and 4 a backup power supply.

A reference numeral 5 denotes a power supply detection unit (detection means) for detecting an ON/OFF command or the like of the battery 2; 6 a reset circuit for initializing a CPU 7 when the power supply detection unit 5 detects the ON command; 7 a CPU for changing the DRAM 1 to a self-refresh mode when the power supply detection unit 5 detects the OFF command; 8 a control unit for switching the power supply source of the DRAM 1 from the step-up/down power supply 3 to the backup power supply 4 when the DRAM 1 is shifted to the self-refresh mode; and numerals 9 to 14 denote selectors. The CPU7, the control unit 8 and the selectors 9 to 14 constitute a control means.

Next, an operation will be described as below.

When the switch of a vehicle key is in an ACC or ON position, power is fed from the battery 2 to the step-up/down power supply 3. From the step-up/down power supply 3, power is fed to the CPU 7 and the DRAM 1. The specific operation of the step-up/down power supply 3 will be described later.

Accordingly, the CPU7 can perform various data processing operations (if it is a CPU for a navigation device, the CPU 7 can execute route searching, map displaying and so on), and stores data regarding such processing in the DRAM 1.

Then, when the switch of the vehicle key is changed to an OFF position, the power supply detection unit 5 detects a power supply OFF command, and notifies the detection to the CPU 7.

Upon receiving the OFF command from the power supply detection unit 5, the CPU 7 sets the DRAM 1 into the self-refresh mode to prevent the loss of data stored in the DRAM 1.

Specifically, since the same data must be written at regular intervals to continuously hold the data in the DRAM 1, the DRAM 1 is changed to the mode of repeating automatic data writing (self-refresh mode). If the DRAM 1 is an SDRAM, when a CKE terminal is at "H", control from an external unit is accepted. On the other hand, when the CKE terminal is at "L", the previous mode is maintained. Thus, the DRAM 1 is changed to the self-refresh mode before the CKE terminal is changed from "H" to "L".

After the shifting of the DRAM 1 to the self-refresh mode, the control unit 8 switches the power supply source of the DRAM 1 from the step-up/down power supply 3 to the backup power supply 4.

Thus, since the DRAM 1 receives power fed from the backup power supply 4 even if the output voltage of the battery 2 drops, data can be held continuously.

Subsequently, when the switch of the vehicle key is returned to the ACC or ON position, the power supply detection unit 5 detects a power supply ON command, and notifies the detection to the reset circuit 6.

Upon receiving the ON command from the power supply detection unit 5, the reset circuit 6 initializes the CPU 7, and the CPU 7 releases the self-refresh mode.

The control unit 8 disconnects the CPU 7 and the DRAM from each other during the initialization of the CPU 7 to prevent the destruction or the like of the data stored in the DRAM 1. After the completion of the initialization of the CPU 7, the control unit 8 connects the CPU 7 and the DRAM 1 with each other, and switches the power supply source of the DRAM 1 from the backup power supply 4 to the step-up/down power supply

3.

As apparent from the foregoing, according to the first embodiment, when the power supply detection unit 5 detects the OFF command of the battery 2, the DRAM 1 is set to the self-refresh mode, and power is fed from the backup power supply 4 to the DRAM 1. Thus, a large amount of data can be saved in the DRAM 1 low in price and large in capacity. Therefore, for example, if an on-vehicle equipment is a navigation device, not only the present position information but surrounding map information and additional information can also be backed up, so that the device can be set to a usable state almost instantaneously when it is actuated at the next time

(Second Embodiment)

Fig. 2 is a schematic diagram showing a step-up/down power supply according to a second embodiment of the invention. In the drawing, a reference 21 denotes a reference wave generation circuit; 22 a step-up DC/DC converter for applying a predetermined voltage V1 by stepping up a voltage V_{IN} applied from the battery 2 when the applied voltage V_{IN} drops below a reference voltage; and 23 a step-down DC/DC converter connected in series to the step-up DC/DC converter 22, and adapted to apply a predetermined voltage V_{OUT} by stepping down a voltage V_{IN} applied from the battery 2 when the applied voltage V_{IN} rises above the reference voltage.

Next, an operation will be described.

In the foregoing first embodiment, when the switch of the vehicle key was in the ACC or ON position, the power was fed from the battery 2 through the step-up/down power supply 3 to the CPU 7 and the DRAM 1. The reason for feeding power through the step-up/down power supply is described below.

For starting an engine, cranking is carried out by actuating a self-starting motor. However, since the cranking operation causes a reduction in the output voltage of the battery 2 (see "+B" in Fig. 3), an operable voltage for the CPU 7 or the DRAM 1 cannot be secured. Thus, the data stored in the DRAM 1 may be lost, and other problems may occur.

The step-up/down power supply 3 is provided to secure operable voltages for the CPU 7 and the DRAM 1 even if the output voltage of the battery 2 is reduced by the cranking operation.

As shown in Fig. 2, the step-up/down power supply 3 includes: a step-up DC/DC converter 22 for applying a predetermined voltage V1 by stepping up a voltage V_{IN} applied from the battery 2 when the voltage V_{IN} drops below the reference voltage; and a step-down DC/DC converter 23 for applying a predetermined voltage V_{OUT} by stepping down a voltage V_{IN} applied from the battery 2 when the voltage V_{IN} raises above the reference voltage.

The step-up DC/DC converter 22 is designed to hardly operate in the operating voltage region of the step-down DC/DC converter 23; and the step-down DC/DC converter 23 to hardly operate in the operating voltage region of the step-up DC/DC converter 22. Accordingly, by individually operating the converters, conversion efficiency can be increased.

In addition, as shown in Fig. 2, the control circuit 22a of the step-up DC/DC converter 22 captures a voltage signal from an output stage X that outputs a predetermined voltage V1, and activates a MOS-FET 22b as a switching device. Accordingly, even if the voltage V_{IN} applied from the battery 2 drops below the operable voltage of MOS-FET 22b, a proper operable voltage can be secured for the MOS-FET 22b. As a result, it is possible to continue a stepping-up operation.

As a step-up/down power supply for outputting a predetermined voltage irrespective of fluctuation in the applied voltage, there has conventionally been available a fly-back type converter using a transformer. However, in the case of the flay-back type converter, convertible power is decided depending on the capacity of the transformer. In the case of the device of a limited area, such as an on-vehicle equipment, the size of the transformer was a bottleneck, making it difficult to construct a large-capacity step-up/down power supply. In the step-up/down power supply 3 shown in Fig. 2, since a choke coil is used instead of the transformer, a mounting area can be designed to be small with respect to a power supply capacity.

As apparent from the foregoing, according to the second embodiment, since the step-up DC/DC converter 22 is provided for applying a predetermined voltage V1 by stepping up a voltage V_{IN} applied from the battery 2 when the voltage V_{IN} drops below the reference voltage, a predetermined voltage can be applied to the on-vehicle equipment even if a cranking operation or the like causes a reduction in the output voltage of

the battery 2, making it possible to stably operate the on-vehicle equipment. Therefore, since the resetting of the navigation device or the like can be prevented at the time of starting the engine, it is also possible to apply the step-up/down power supply to a car in an idling stop state.

(Third Embodiment)

In the foregoing first embodiment, when the DRAM 1 is shifted to the self-refresh mode, the power supply source of the DRAM 1 is switched from the step-up/down power supply 3 to the backup power supply 4. However, it can also be arranged such that the CPU 7 designates one memory area among a plurality of memory areas A to C, which receives power from the backup power supply 4 (e.g., in the case where there is data stored in the memory area A while no data have been stored in the memory areas B and C, only the memory area A is set to receive power by controlling the selectors 9 and 10), and the control unit 8 provides power only to the thus designated memory area.

Thus, it is possible to reduce the consumption of power during the period in which a backing-up operation is being performed.

(Fourth Embodiment)

The foregoing third embodiment has been explained as to the case where a memory area that can receive power from the backup power supply 4 is designated, and only the thus designated memory area can be provided with power. However, a backup verification mechanism for indicating information regarding the memory area designated to receive power from the backup power supply 4 may be provided on the memory map of the CPU 7.

Thus, it is possible to verify the normal ending of previous processing, the execution of normal backing-up during the stopped period, and an unexpected memory loss or the like caused by a reduction or the like in the backup power supply 4 during the backing-up operation.

(Fifth Embodiment)

The foregoing first embodiment has been explained as to the case in which the step-up/down power supply 3 was provided for securing the operable voltage of the CPU 7 or the DRAM 1 even if a reduction in the

output voltage of the battery 2 is caused due to the cranking operation. However, it can be arranged such that when a reduction occurs in the output voltage of the battery 2, the feeding of power from the battery 2 to a certain equipment is stopped.

Thus, in a case where the output voltage of the battery 2 drops because of the cranking operation or the like, power supply for equipments such as a CD-ROM, DVD, and a display LCD, which are other than main body function, can be reduced, so that it is possible to suppress a reduction in the output voltage of the battery 2.

Industrial Applicability

As can be understood from the foregoing, the data backup apparatus of the invention is suitable for backing up a large amount of data by properly feeding power to the large-capacity dynamic RAM installed in the on-vehicle equipment.

In addition, the step-up/down power supply of the invention is suitable for stably operating an on-vehicle equipment by applying a predetermined voltage to the on-vehicle equipment even when fluctuation occurs in a voltage applied from the main power supply such as a battery.

WHAT IS CLAIMED IS:

1. A data backup apparatus, comprising:

a dynamic RAM for storing data;

detection means for detecting an OFF command of a main power supply; and

control means for changing said dynamic RAM to a self-refresh mode when said detection means detects the OFF command of the main power supply, and feeding power from a backup power supply to said dynamic RAM.

2. The data backup apparatus according to claim 1, wherein said control means makes the dynamic RAM supplied with power from the main power supply during the period from the detection of the OFF command of the main power supply to completion of the changing to the self-refresh mode.

3. The data backup apparatus according to claim 1, wherein said control means designates one memory area that receives power from the backup power supply among a plurality of memory areas constituting said dynamic RAM, and feeds power only to the thus designated memory area.

4. The data backup apparatus according to claim 3, wherein said control means indicates information regarding the memory area that receives power from the backup power supply.

5. The data backup apparatus according to claim 1, wherein said control means stops feeding of power from the main power supply to a predetermined equipment, when an output voltage of the main power supply is reduced.

6. The data backup apparatus according to claim 1, wherein if an SDRAM is used as the dynamic RAM, said control means and said SDRAM are kept separated from each other until initial setting of said control means is completed.

7. A step-up/down power supply comprising:

a step-up DC/DC converter for outputting a predetermined voltage by stepping up a voltage applied from a main power supply when the applied voltage drops below a reference voltage; and

a step-down DC/DC converter connected in series with said step-up DC/DC converter, and adapted to output a predetermined voltage by stepping down the voltage applied from the main power supply when the applied voltage rises above the reference voltage.

8. A step-up/down power supply according to claim 7, characterized in that said step-up DC/DC converter captures a voltage signal from outputting means for outputting a predetermined voltage, and drives a switching device.

FIG.1

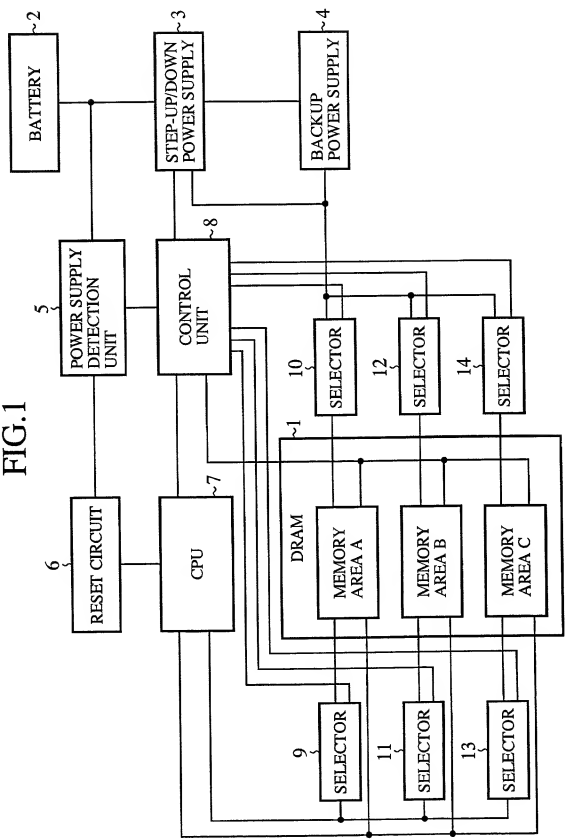

FIG.2

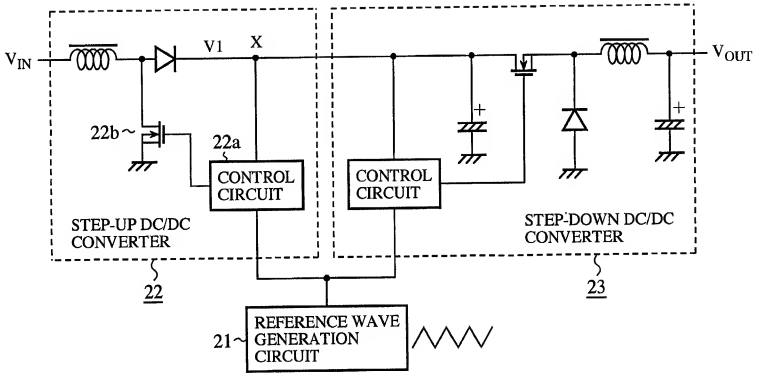

FIG.3

Declaration and Power of Attorney for Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明として、以下の通り宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

My residence, post office address and citizenship are as stated below next to my name,

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

_____

_____

_____

"DATA BACK UP APPARATUS AND STEP-UP/DOWN POWER SUPPLY"

その明細書を
（該当するほうに印を付す）

the specification of which
(check one)

☐ ここに添付する。

☐ is attached hereto.

☐ _____ 日に出願番号

第 _____ 号として提出し、

_____ 日に補正した。
（該当する場合）

☒ was filed on June 8, 2000 as International Application Serial No. PCT/JP00/03732

and was amended on _____
(if applicable)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37部第1章第56条(a)項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条、第172条、又は第365条に基づく下記の外国特許出願又は発明者証出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願又は発明者証出願を以下に明記する：

I hereby claim foreign priority benefits under Title 35, United States Code §119, §172 or §365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign applications
先の外国出願

			Priority claimed 優先権の主張	
(Number) (番　号)	(Country) (国　名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番　号)	(Country) (国　名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番　号)	(Country) (国　名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番　号)	(Country) (国　名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番　号)	(Country) (国　名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし

私は、合衆国法典第35部第120条に基づく下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規定の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日又はＰＣＴ国際出願日の間に公表された連邦規則法典第37部第1章第56条(a)項に記載の所要の情報を開示すべき義務を有することを認める。

I hereby claim the benefit of Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose any material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現　況) (Status) 特許済み、係属中、放棄済み (patended, pending abandoned)
(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現　況) (Status) 特許済み、係属中、放棄済み (patended, pending abandoned)

私は、ここに自己の知識に基づいて行った陳述がすべて真実であり、自己の有する情報及び信ずるところに従って行った陳述が真実であると信じ、更に故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁固に処せられるか、又はこれらの刑が併科され、又はかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損なうことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true; and further that all statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Japanese Language Declaration

委任状： 私は、下記発明者として、以下の代理人をここに選任し、本願の手続きを遂行すること並びにこれに関する一切の行為を特許商標局に対して行うことを委任する。
（代理人氏名及び登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. ***(list name and registration number)***

I hereby appoint John H. Mion, Reg. No. 18,879; Donald E. Zinn, Reg. No. 19,046; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Robert G. McMorrow, Reg. No. 19,093; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765, my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC, 2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037-3202.

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書類の送付先： Send Correspondence to:

SUGHRUE, MION, ZINN, MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037

直通電話連絡先： （名称及び電話番号） Direct Telephone Calls to: ***(name and telephone number)***

(202)293-7060

唯一の又は第一の発明者の氏名	Full name of sole or first inventor Chikara YOKOYAMA
同発明者の署名 日付	Inventor's signature Date Chikara YOKOYAMA Dec. 26, 2001
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国籍	Citizenship Japanese
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（第三又はそれ以降の共同発明者に対しても同様な情報および署名を提供すること。）

(Supply similar information and signature for third and subsequent joint inventors.)